

JC12 Rec'd PCT/PTC 28 SEP 2005

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
AS INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

International Application No. : PCT/US2004/009619
International Filing Date : 29 March 2004 (29.03.2004)
Earliest Priority Date : 28 March 2003 (28.03.2003)
Applicant(s) : C.R. BARD, INC. ET AL.
Title : METHOD AND APPARATUS FOR
ELECTROSURGICAL ABLATION

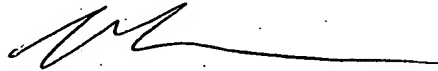
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Alexandria, VA 22313-1450

Transmitted herewith for filing a Demand for International Preliminary Examination, Article 34 Amendment and Fee Calculation Sheet with Deposit Account Authorization.

A check in the amount of \$912.00 is enclosed to cover the fee. If this is insufficient, please charge any deficiency, or credit any overpayment in the total fees, to the account of Wolf, Greenfield & Sacks, P.C., Deposit Account No. 23/2825.

If the enclosed papers are considered incomplete, the Mail Room and/or the Application Branch is respectfully requested to contact the undersigned collect at (617) 646-8000, Boston, Massachusetts.

Respectfully submitted,



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DOCKET NO.: B1075.71017

DATE: 28 January 2005

x 1/28/05

Express Mail Label No.: EV335878273US

The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of the Authority may be indicated by the applicant on the line below:

IPEA/US

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty:

The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty

For International Preliminary Examining Authority use only

Identification of IPEA	Date of Receipt of DEMAND
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Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION		Applicant's or agent's file reference B1075.71017
International Application No. PCT/US2004/009619	International Filing Date (day/month/year) 29 March 2004 (29.03.2004)	(Earliest) Priority date (day/month/year) 28 March 2003 (28.03.2003)
Title of Invention METHOD AND APPARATUS FOR ELECTROSURGICAL ABLATION		
Box No. II APPLICANT(S)		
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) C.R. BARD, INC. 730 Central Avenue Murray Hill, New Jersey 07974 United States of America		Telephone No.:
		Facsimile No.:
		Teleprinter No.:
State (that is, country) of nationality: US	State (that is, country) of residence: US	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) SAGON, Stephen W. 129 Mack Hill Road Amherst, New Hampshire 03031 United States of America		
State (that is, country) of nationality: US	State (that is, country) of residence: US	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) STEVENS-WRIGHT, Debbie 175 Candlestick Road North Andover, Massachusetts 01845 United States of America		
State (that is, country) of nationality: US	State (that is, country) of residence: US	
X Further applicants are indicated on a continuation sheet.		

Form PCT/IPEA/401 (first sheet) (January 2004)
Express Mail Label No. EV335878273US

See Notes to the demand form

Sheet No. 2		International application No. PCT/US2004/009619
Continuation of Box No. II APPLICANT(S)		
<i>If none of the following sub-boxes is used, this sheet is not to be included in the demand.</i>		
Name and address: <i>(Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country.)</i> MORGAN, John Wessex Cardiac Center, Southampton University Hospital E level, Room 133A Trmona Road Southampton S016 6YD United Kingdom		
State (i.e. country) of nationality: GB		State (i.e. country) of residence: GB
Name and address: <i>(Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country.)</i> 		
State (i.e. country) of nationality:		State (i.e. country) of residence:
Name and address: <i>(Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country.)</i> 		
State (i.e. country) of nationality		State (i.e. country) of residence:
Name and address: <i>(Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country.)</i> 		
State (i.e. country) of nationality:		State (i.e. country) of residence:
O Further applicants are indicated on another continuation sheet.		

Form PCT/IPEA/401 (continuation sheet) (January 1994; reprint January 1997) See Notes to the demand form

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCEThe following person is ☒ agent ☐ common representative

And ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination.
☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.
☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Attorney, in addition to the agent(s)/common representative appointed earlier.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

MORRIS, James H.
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Teleprinter No.:

☐ **Address for Correspondence:** Mark this check box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION**Statement concerning amendments:***

1. The applicant wishes the international preliminary examination to start on the basis of:

☒ the international application as originally filed to include the Rectification of Obvious Errors as filed on 01 July 2004

the description ☐ as originally filed
☒ as amended under Article 34

the claims ☐ as originally filed
☐ as amended under Article 19 (together with any accompanying statement)
☒ as amended under Article 34

the drawings ☐ as originally filed
☒ as amended under Article 34

2. ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.
3. ☐ The applicant wishes the start of the international preliminary examination to be postponed until the expiration of the applicable time limit under Rule 69.1(d).
4. ☐ The applicant wishes the start of the international preliminary examination to start earlier than the expiration of the applicable time limit under Rule 69.1(d).

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: . . . English

- ☒ which is the language in which the international application was filed.
☐ which is the language of a translation furnished for the purposes of international search.
☐ which is the language of publication of the international application
☐ which is the language of the translation to be furnished for the purposes of international preliminary examination.

Box No. V ELECTION OF STATES

The filing of this demand constitutes the election of all Contracting States which are designated and are bound by Chapter II of the PCT.

Box No. VI CHECKLIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

- | | | | | |
|----|---|---|----|--------|
| 1. | translation of international application | : | | sheets |
| 2. | amendments under Article 34 | : | 12 | sheets |
| 3. | copy (or, where required, translation) of amendments under Article 19 | : | | sheets |
| 4. | copy (or, where required, translation) of statement under Article 19 | : | | sheets |
| 5. | letter | : | 6 | sheets |
| 6. | other (<i>specify</i>) | : | | sheets |

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Examining Authority use only

Received	not received
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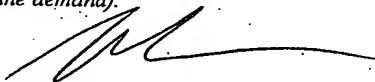


The demand is also accompanied by the item(s) marked below:

- | | |
|--|---|
| 1. <input checked="" type="checkbox"/> fee calculation sheet | 4. <input type="checkbox"/> statement explaining lack of signature |
| 2. <input type="checkbox"/> separate signed power of attorney | 5. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form |
| 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: | 6. <input checked="" type="checkbox"/> other (<i>specify</i>):
Transmittal letter
Postcard
Check |

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).



AMUNDSEN, Eric

For International Preliminary Examining Authority use only

- | | |
|--|---|
| 1. Date of actual receipt of DEMAND: | |
| 2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b): | |
| 3. <input type="checkbox"/> The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply. | <input type="checkbox"/> The applicant has been informed accordingly. |
| 4. <input type="checkbox"/> The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5. | |
| 5. <input type="checkbox"/> Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82. | |
| 6. <input type="checkbox"/> The date of receipt of the demand is AFTER the expiration of the time limit under Rule 54bis.1(a) and item 7 or 8 below, does not apply. | |
| 7. <input type="checkbox"/> The date of receipt of the demand is WITHIN the time limit under Rule 54bis.1(a) as extended by virtue of Rule 80.5. | |
| 8. <input type="checkbox"/> Although the date of receipt of the demand is after the expiration of the time limit under Rule 54bis.1(a), the delay in arrival is EXCUSED pursuant to Rule 82. | |

For International Bureau use only

Demand received from IPEA on:

Form PCT/IPEA/401 (last sheet) (January 2004)


See Notes to the demand form

PCT

FEE CALCULATION SHEET

Annex to the Demand for international preliminary examination

For International Preliminary Examining Authority use only

International Application No. PCT/US2004/009619		Date stamp of the IPEA
Applicant's or agent's File reference: B1075.71017		
Applicant C.R. BARD, INC. ET AL.		
Calculation of prescribed fees		
1. Preliminary examination fee	\$750.00 (USPTO was not ISA)	P
2. Handling fee	\$162.00	H
3. Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box	\$912.00	
		TOTAL
Mode of Payment		
<input type="checkbox"/> authorization to charge deposit account with the IPEA (see below)	<input type="checkbox"/> cash	
<input checked="" type="checkbox"/> cheque	<input type="checkbox"/> revenue stamps	
<input type="checkbox"/> postal money order	<input type="checkbox"/> coupons	
<input type="checkbox"/> bank draft	<input type="checkbox"/> other (specify):	
Deposit Account Authorization (this mode of payment may not be available at all IPEAs) The IPEA/US <input type="checkbox"/> is hereby authorized to charge the total fees indicated above to my deposit account. <input checked="" type="checkbox"/> (this check-box may be marked only if the conditions for deposit accounts of the IPEA so permit) is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.		
23/2825	28/11/2005	
Deposit Account Number	Date (day/month/year)	AMUNDSEN, Eric
Form PCT/IPEA/401 (Annex) (July 1998; reprint January 2000)		
See notes to the fee calculation sheet		

JC12 Rec'd PCT/PTC 28 SEP 2005

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
AS INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

International Application No.: PCT/US2004/009619
International Filing Date: 20 March 2004 (29.03.2004)
Earliest Priority Date: 28 March 2003 (28.03.2004)
Applicant(s): C.R. BARD, INC., ET AL.
Title: METHOD AND APPARATUS FOR
ELECTROSURGICAL ABLATION

Mail Stop PCT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

**RESPONSE TO WRITTEN OPINION
AMENDMENT UNDER PCT ARTICLE 34(2)(b)**

In response to the Written Opinion mailed August 26, 2004 (26.08.2004), Applicant respectfully requests reconsideration of the above-identified application by the International Preliminary Examining Authority in view of the following remarks and amendments to the claims under PCT Article 34(2)(b).

Please substitute the enclosed sheets labeled as pages 16-24 for original pages 16-24, please add the enclosed sheet labeled as page 25, and consider the pages filed herewith to establish the International Preliminary Examination Report. Please substitute enclosed drawing sheet labeled as 3/4 for original drawing sheet 3/4 (Figures 10-15). Figures 13 and 15 have been amended.

Per this amendment, originally filed claims 1 and 4 (now claims 1 and 7) have been amended. No claims have been canceled. New claims 4, 5, 6, 10 and 67 have been added. New claim 67 is originally filed dependent claim 2 rewritten in independent form.

Claims 1-67 are now pending in the application. The chart below shows the correspondence of originally filed claim numbers 1-62 to currently pending claim numbers 1-67.

Originally Filed Claim Number	Corresponding Current Claim Number
1	1 (amended)
2	2
3	3
	4 (new)

	6 (new)
4	7
5	8
6	9
	10 (new)
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61	65
62	66
-	67 (new)

REMARKS

In response to the Written Opinion, originally filed claims 1 and 4 have been amended (now claims 1 and 7) and new claim 10 has been added.

Claim 1 has been amended to recite that the catheter is constructed and arranged to change a distance between the tissue surface and one of the ablation ring electrode and the shaft near the ablation ring electrode, without changing a distance between the tissue surface and the other of the ablation ring electrode and the shaft near the ablation ring electrode. Support for these amendments can be found throughout the application. For example, Figures 3-5 show an embodiment of a catheter constructed and arranged to change the distance between the tissue surface and the shaft near the ablation ring electrode without changing the distance between the tissue surface and the electrode (e.g., zero distance). A description of the embodiment shown in Figures 3-5 may be found at p.9, line 20 – p.10, line 31. Figures 11-16 show embodiments of a catheter constructed and arranged to change the distance between the tissue surface and the ablation ring electrode without changing the distance between the tissue and the shaft near the ablation electrode. Descriptions of these embodiments can be found at p.13, line 1 – p.14, line 18.

Applicants acknowledge and appreciate the Examiner's finding that dependent claim 2 meets the requirements of the PCT with respect to novelty, inventive step, and industrial applicability. Claim 2 has been rewritten as claim 67 in independent form to include all of the limitations of the claim from which it depends (previously pending claim 1).

Regarding dependent claim 3, Applicants wish to point out that document D3 (U.S. Patent No. 5,098,431 to Rydell) is silent as to whether body 36 is eccentrically shaped.

Column 3, lines 32-35 only discloses that body 36 is fastened to member 30 at a location offset from the central axis by a small eccentricity. This disclosure is silent as to the symmetry or eccentricity of the shape of body 36.

Figures 13 and 15 have been amended to correctly reflect the eccentric and circular cross-section configurations that were shown in the informal drawings submitted with the application. The first set of formal drawings incorrectly reversed the cross-sections of the embodiments shown in the two figures.

In response to Item III of the Written Opinion, Applicant would like to point out that each independent claim is distinct and each independent claim also is clear and concise. While the application is directed generally to adjusting the distance of an ablation electrode and/or a catheter shaft to a tissue surface, each independent claim is distinct.

Amended claim 1 is directed to a catheter for ablating tissue comprising a shaft for positioning an ablation ring electrode in contact with or near a tissue surface, and an ablation ring electrode disposed on the shaft. The catheter is constructed and arranged to change a distance between the tissue surface and one of the ablation ring electrode and the shaft near the ablation ring electrode, without changing a distance between the tissue surface and the other of the ablation ring electrode and the shaft near the ablation ring electrode.

Amended claim 7 is directed to a method of adjusting a distance between a tissue surface and one of a shaft and an electrode. The method comprises positioning a catheter shaft at a first distance from a tissue surface, the catheter shaft being near an ablation ring electrode that is mounted on the shaft; positioning the ablation ring electrode in contact with the tissue surface; and moving the catheter shaft to a second distance from the tissue surface, the second distance being different than the first distance, while maintaining the ablation ring electrode in contact with the tissue surface.

New claim 10 is directed to a method of adjusting a distance between a tissue surface and one of a shaft and an electrode. The method comprises positioning the ablation ring electrode at a first distance from the tissue surface; positioning a catheter shaft at a shaft distance from a tissue surface, the catheter shaft being near an ablation ring electrode that is mounted on the shaft; and moving the ablation ring electrode to a second distance from the tissue surface, the second distance being different than the first distance, while maintaining the catheter shaft at the shaft distance from the tissue surface.

Claim 11 is directed to a catheter for ablating tissue. The catheter comprises a shaft for positioning an ablation electrode in contact with a tissue surface, the shaft having a longitudinal axis, and an ablation electrode rotatably disposed on the shaft and constructed

and arranged to change a distance between the shaft and the tissue surface when rotated around the shaft longitudinal axis.

Claim 32 is directed to a catheter for ablating tissue. The catheter comprises a shaft having a longitudinal axis, and an ablation electrode disposed on the shaft and having a continuous outer surface. The electrode outer surface circumscribes the shaft along a length of the shaft and is eccentric in a radial cross-section.

Claim 44 is directed to a catheter for ablating tissue. The catheter comprises a shaft for positioning an ablation electrode in contact with a tissue surface, the shaft having an outer surface that is eccentric in a cross-section, and an ablation electrode disposed on the shaft. In a first shaft orientation, the shaft outer surface is positioned a first distance from the tissue surface in the vicinity of the ablation electrode, and in a second, rotated shaft orientation, the shaft outer surface is positioned a second distance from the tissue surface in the vicinity of the ablation electrode, the second distance being different than the first distance.

Claim 45 also is directed to a catheter for ablating tissue. The catheter comprises a shaft for positioning an ablation electrode at a distance from a tissue surface and an ablation electrode disposed on the shaft and having an outer surface. The ablation electrode is moveable along the shaft in a longitudinal direction and the shaft is configured such that movement of the ablation electrode along the shaft in the longitudinal direction changes the distance between the electrode outer surface and the tissue surface.

Claim 49 is directed to a catheter for ablating tissue that comprises a shaft for positioning an ablation electrode in contact with a tissue surface, and an ablation electrode disposed on the shaft and having an outer surface. The ablation electrode is moveable along the shaft in a longitudinal direction and the shaft is configured such that movement of the ablation electrode along the shaft in the longitudinal direction positions the electrode surface at a distance from the tissue surface.

Claim 50 is directed to a catheter for ablating tissue that comprises a shaft for positioning an ablation electrode at a distance from a tissue surface, and an ablation electrode rotatably disposed on the shaft and constructed and arranged to change a distance between an outer surface of the ablation electrode and the tissue surface when rotated relative to the shaft longitudinal axis.

Claim 53 is directed to a method of changing a distance from an outer surface of a catheter shaft to a tissue surface. The method comprises placing an ablation electrode into contact with a tissue surface using a catheter shaft such that an outer surface of the catheter shaft is disposed a distance from the tissue surface in the vicinity of the ablation electrode.

The method further comprises rotating the ablation electrode to change the distance from the outer surface of the catheter shaft to the tissue surface.

Claim 64 is directed to a method of changing a distance from an ablation electrode to a tissue surface that comprises disposing an ablation electrode at a first distance from a tissue surface using a catheter shaft having a longitudinal direction, and disposing the ablation electrode at a second distance, different than the first distance, from the tissue surface by moving the ablation electrode along the catheter shaft in the longitudinal direction.

A favorable International Preliminary Report on Patentability in response is requested.

Respectfully submitted,



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DATE: 28 January 2005

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27 of electrode 21 along portions of the electrode perimeter such that in some orientations, electrode 21 is spaced from tissue surface 25, while in other orientations, shaft 12 is spaced from tissue surface 25.

Referring now to Fig. 9, in another embodiment, electrode 21 may have a flat surface 34 that increases a contact area between electrode 21 and tissue surface 25 when electrode 21 is placed in a certain orientation. As illustrated in Fig. 9, flat surface 34 may be positioned on electrode outer surface 27 such that shaft 12 is at a maximum distance from tissue surface 25 when flat surface 34 is in contact with tissue surface 25. This arrangement may facilitate positioning shaft 12 at a known, pre-determined distance from tissue surface 25. In other embodiments, more than one flat surface may be provided and in still further embodiments the entire electrode outer surface 27 may be formed with flat surfaces. Various flat surfaces may space shaft 12 at different distances from tissue surface 25. In such an embodiment, a measurement of the rotation angle of the electrode can indicate the distance from shaft 12 to tissue surface 25.

Referring now to Fig. 10, one embodiment of an attachment of electrode 21 to shaft 12 and an electrical connection of electrode 21 is illustrated. Lumen 42 extends longitudinally through shaft 12. An electrical lead 48 for providing electrical energy to electrode 21 runs through lumen 42 and passes through a passage 44 in a shaft wall 46 near electrode 21. Electrical lead 48 is soldered, welded, or otherwise electrically connected to electrode 21. If electrode 21 is configured to rotate with shaft 12, electrode 21 may be fixed to shaft 12 with a suitable adhesive or other suitable fixing means. As is known to one skilled in the art, other electrode attachment arrangements are possible.

In embodiments of the present invention that include an electrode that is rotatable relative to shaft 12, an electrical connection between electrical lead and electrode 21 may be accomplished with a brush (not shown) or a biased protrusion (not shown) that remains in contact with an inner surface of a rotating electrode 21.

- 16 -

CLAIMS

1. A catheter for ablating tissue comprising:
a shaft for positioning an ablation ring electrode in contact with or near
a tissue surface; and
5 an ablation ring electrode disposed on the shaft;
wherein the catheter is constructed and arranged to change a distance
between the tissue surface and one of the ablation ring electrode and the shaft near the
ablation ring electrode, without changing a distance between the tissue surface and the
other of the ablation ring electrode and the shaft near the ablation ring electrode.
10
2. The catheter according to claim 1, wherein the ablation ring electrode
is rotatably disposed on the shaft and constructed and arranged to change the distance
between the shaft near the ablation ring electrode and the tissue surface when rotated
around a shaft longitudinal axis.
15
3. The catheter according to claim 1, wherein the ablation ring electrode
is eccentrically shaped.
4. A catheter according to claim 1, wherein the catheter is constructed
20 and arranged to change a distance between the tissue surface and one of the ablation
ring electrode and the shaft near the ablation ring electrode by rotation of the shaft
and/or electrode, or movement of the electrode relative to the shaft.
5. A catheter according to claim 1, wherein the catheter is constructed
25 and arranged to change a distance between the tissue surface and the ablation ring
electrode without changing a distance between the tissue surface and the shaft near
the ablation ring electrode.
6. A catheter according to claim 1, wherein the catheter is constructed
30 and arranged to change a distance between the tissue surface and the shaft near the

ablation ring electrode without changing a distance between the tissue surface and the ablation ring electrode.

7. A method of adjusting a distance between a tissue surface and one of a
5 shaft and an electrode, comprising:

positioning a catheter shaft at a first distance from a tissue surface, the
catheter shaft being near an ablation ring electrode that is mounted on the shaft;

positioning the ablation ring electrode in contact with the tissue
surface; and

10 moving the catheter shaft to a second distance from the tissue surface,
the second distance being different than the first distance, while maintaining the
ablation ring electrode in contact with the tissue surface.

8. The method according to claim 4, comprising rotating the ablation ring
15 electrode relative to the catheter shaft.

9. The method according to claim 5, wherein the ablation ring electrode is
mounted eccentrically.

20 10. A method of adjusting a distance between a tissue surface and one of a
shaft and an electrode, comprising:

positioning the ablation ring electrode at a first distance from the tissue
surface;

25 positioning a catheter shaft at a shaft distance from a tissue surface, the
catheter shaft being near an ablation ring electrode that is mounted on the shaft; and

moving the ablation ring electrode to a second distance from the tissue
surface, the second distance being different than the first distance, while maintaining
the catheter shaft at the shaft distance from the tissue surface.

11. A catheter for ablating tissue, comprising:
a shaft for positioning an ablation electrode in contact with a tissue surface, the shaft having a longitudinal axis; and
an ablation electrode rotatably disposed on the shaft and constructed
5 and arranged to change a distance between the shaft and the tissue surface when rotated around the shaft longitudinal axis.
12. The catheter according to claim 11, wherein the ablation electrode has one continuous outer surface.
- 10 13. The catheter according to claim 11, wherein the ablation electrode is stiff.
14. The catheter according to claim 11, wherein the ablation electrode has
15 an outer surface constructed of a single piece of material.
15. The catheter according to claim 11, wherein the ablation electrode has an outer surface that is oval in a radial cross-section.
- 20 16. The catheter according to claim 11, wherein the ablation electrode has an outer surface that is eccentric in a radial cross-section.
17. The catheter according to claim 11, wherein the ablation electrode has an outer surface that is asymmetric in a radial cross-section.
- 25 18. The catheter according to claim 11, wherein the ablation electrode has an outer surface that is non-circular in a radial cross-section.
19. The catheter according to claim 11, wherein the ablation electrode has
30 a center longitudinal axis and the shaft longitudinal axis is a center longitudinal axis;
and

the ablation electrode is disposed on the shaft such that the ablation electrode center longitudinal axis and the shaft center longitudinal axis are eccentric.

20. The catheter according to claim 11, wherein the ablation electrode is
5 rotatable relative to the shaft.

21. The catheter according to claim 11, wherein the ablation electrode and the shaft are rotatable together.

10 22. The catheter according to claim 11, wherein the shaft is oval in a radial cross-section.

23. The catheter according to claim 11, wherein the shaft is asymmetric in a radial cross-section.
15

24. The catheter according to claim 11, wherein the shaft is eccentric in a radial cross-section.

25. The catheter according to claim 11, wherein the shaft is non-circular in
20 a radial cross-section.

26. The catheter according to claim 25, wherein the ablation electrode is circular in radial cross-section.

25 27. The catheter according to claim 25, wherein a width of the ablation electrode is larger than a width of the shaft.

28. The catheter according to claim 17, wherein the shaft is circular in radial cross-section.
30

29. The catheter according to claim 17, wherein a width of the ablation electrode is larger than a width of the shaft.

30. The catheter according to claim 11, wherein the ablation electrode is a
5 ring electrode.

31. The catheter according to claim 11', in combination with an ablation energy supply, the energy ablation supply being electrically connected to the ablation electrode.
10

32. A catheter for ablating tissue, comprising:
a shaft having a longitudinal axis;
an ablation electrode disposed on the shaft and having a continuous outer surface, wherein the electrode outer surface circumscribes the shaft along a
15 length of the shaft and is eccentric in a radial cross-section.

33. The catheter according to claim 32, wherein the shaft longitudinal axis is a center longitudinal axis and the ablation electrode outer surface has a center longitudinal axis; and
20 the center longitudinal axis of the ablation electrode outer surface and the shaft center longitudinal axis are eccentric.

34. The catheter according to claim 33, wherein the ablation electrode outer surface has bipolar symmetry about only one axis in a radial cross-section.
25

35. The catheter according to claim 32, wherein the outer surface of the ablation electrode is stiff.

36. The catheter according to claim 32, wherein the ablation electrode has
30 an outer surface constructed of a single piece of material.

37. The catheter according to claim 32, wherein the ablation electrode is rotatable around the shaft longitudinal axis.

38. The catheter according to claim 37, wherein the ablation electrode is
5 rotatable relative to the shaft.

39. The catheter according to claim 37, wherein the ablation electrode is rotatable together with the shaft.

10 40. The catheter according to claim 37, wherein the ablation electrode is constructed and arranged to change a distance between an outer surface of the shaft and a tissue surface when rotated around the shaft longitudinal axis.

41. The catheter according to claim 32, wherein the electrode outer surface
15 is oval in a radial cross-section.

42. The catheter according to claim 32, wherein the electrode outer surface has a flat surface.

20 43. The catheter according to claim 32, in combination with an ablation energy supply, the energy ablation supply being electrically connected to the ablation electrode.

44. A catheter for ablating tissue, comprising:
25 a shaft for positioning an ablation electrode in contact with a tissue surface, the shaft having an outer surface that is eccentric in a cross-section;
an ablation electrode disposed on the shaft;
wherein, in a first shaft orientation, the shaft outer surface is positioned a first distance from the tissue surface in the vicinity of the ablation electrode, and in a
30 second, rotated shaft orientation, the shaft outer surface is positioned a second

distance from the tissue surface in the vicinity of the ablation electrode, the second distance being different than the first distance.

5 45. A catheter for ablating tissue, comprising:
 a shaft for positioning an ablation electrode at a distance from a tissue
 surface;
 an ablation electrode disposed on the shaft and having an outer surface;
 wherein the ablation electrode is moveable along the shaft in a
 longitudinal direction and the shaft is configured such that movement of the ablation
10 electrode along the shaft in the longitudinal direction changes the distance between
 the electrode outer surface and the tissue surface.

 46. The catheter according to claim 45, wherein the ablation electrode is a
 ring electrode.

15 47. The catheter according to claim 45, wherein the electrode outer surface
 is eccentric in a cross-section.

 48. The catheter according to claim 45, wherein a longitudinal portion of
20 the shaft is constructed and arranged to be spaced from the tissue surface.

 49. A catheter for ablating tissue, comprising:
 a shaft for positioning an ablation electrode in contact with a tissue
 surface;
25 an ablation electrode disposed on the shaft and having an outer surface;
 wherein the ablation electrode is moveable along the shaft in a
 longitudinal direction and the shaft is configured such that movement of the ablation
 electrode along the shaft in the longitudinal direction positions the electrode surface at
 a distance from the tissue surface.

30 50. A catheter for ablating tissue, comprising:

a shaft for positioning an ablation electrode at a distance from a tissue surface; and

an ablation electrode rotatably disposed on the shaft and constructed and arranged to change a distance between an outer surface of the ablation electrode and the tissue surface when rotated relative to the shaft longitudinal axis.

51. The catheter according to claim 50, wherein the outer surface of the ablation electrode is eccentric in a cross-section.

52. The catheter according to claim 50, wherein the ablation electrode outer surface has a center axis that is eccentric with a center axis of the portion of the shaft on which the ablation electrode is disposed.

53. A method of changing a distance from an outer surface of a catheter shaft to a tissue surface, comprising:

- (a) placing an ablation electrode into contact with a tissue surface using a catheter shaft such that an outer surface of the catheter shaft is disposed a distance from the tissue surface in the vicinity of the ablation electrode; and
- (b) rotating the ablation electrode to change the distance from the outer surface of the catheter shaft to the tissue surface.

54. The method according to claim 53, wherein the ablation electrode is eccentrically mounted on the catheter shaft.

55. The method according to claim 53, wherein the ablation electrode has an outer surface that is eccentric in a cross-section.

56. The method according to claim 53, wherein the ablation electrode has a continuous outer surface.

57. The method according to claim 53, wherein the outer surface of the ablation electrode is stiff.

58. The method according to claim 53, wherein an outer surface the
5 ablation electrode is constructed of a single piece of material.

59. The method according to claim 53, wherein the ablation electrode is a ring electrode.

10 60. The method according to claim 53, wherein (b) comprises rotating the catheter shaft.

61. The method according to claim 53, wherein (b) comprises rotating the ablation electrode relative to the catheter shaft.

15 62. The method according to claim 53, wherein (b) comprises moving the ablation electrode along the shaft to rotate the ablation electrode relative to the catheter shaft.

20 63. The method according to claim 53, wherein the electrode is a ring electrode.

64. A method of changing a distance from an ablation electrode to a tissue surface, comprising:

25 (a) disposing an ablation electrode at a first distance from a tissue surface using a catheter shaft having a longitudinal direction; and

(b) disposing the ablation electrode at a second distance, different than the first distance, from the tissue surface by moving the ablation electrode along the catheter shaft in the longitudinal direction.

30 65. The method according to claim 64, further comprising:

(c) rotating the ablation electrode to change the distance from the catheter shaft to the tissue surface.

66. The method according to claim 64, wherein the ablation electrode is a
5 ring electrode.

67. A catheter for ablating tissue, comprising:
a shaft for positioning an ablation ring electrode in contact with or near
a tissue surface; and
10 an ablation ring electrode disposed on the shaft; wherein
a distance from the shaft near the ablation ring electrode to the tissue
surface is adjustable; and
the ablation ring electrode is rotatably disposed on the shaft and
constructed and arranged to change the distance between the shaft near the ablation
15 ring electrode and the tissue surface when rotated around a shaft longitudinal axis.

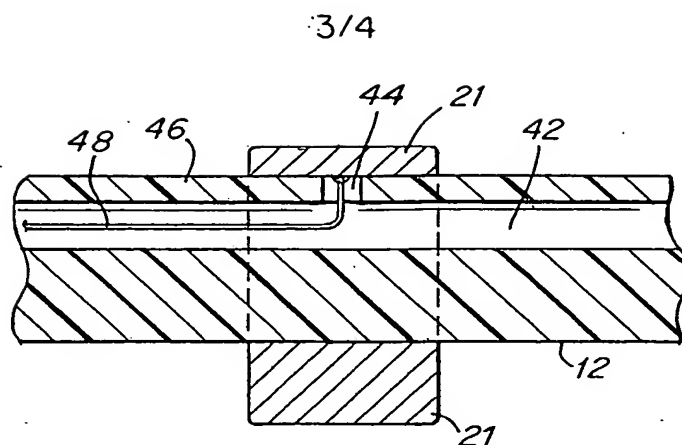


Fig. 10

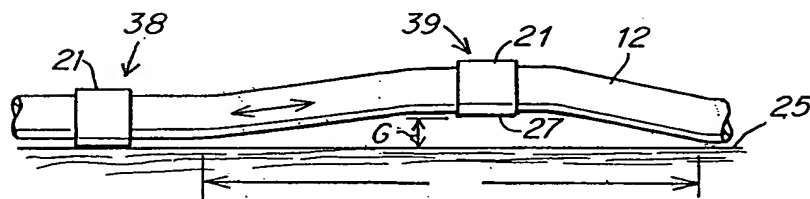


Fig. 11

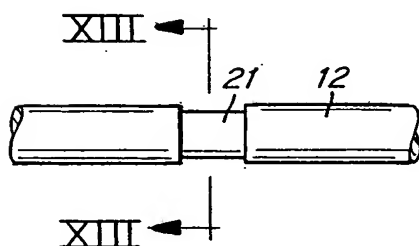


Fig. 12

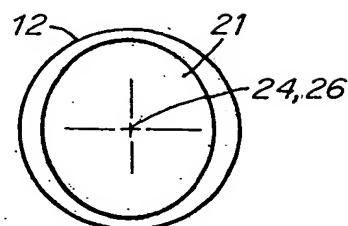


Fig. 13

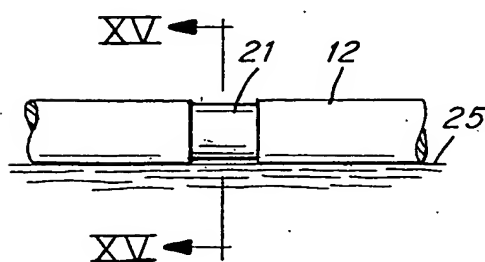


Fig. 14

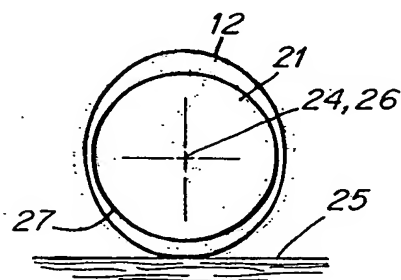


Fig. 15

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